NOTES FROM PACIFIC COAST OBSERVATORIES

The Motion in Some A Double Stars
Fifth Note

During the year 1919, the remeasurement of the double stars of my own discovery continued to form the main part of my observing program. Of the pairs A 1 to A 2500 only 83 now remain without any measures at a second epoch; about 150 others have been remeasured on one or more nights but are kept on the observing program for further measures. Nearly 25 per cent of the pairs remeasured during the year have shown change in angle, or distance, or both, in the interval since discovery, which appears to be greater than can be accounted for by errors of observation. The change in the majority of these pairs is doubtless due to orbital motion. Twenty-two of the most interesting of these systems are listed in the following table, which is similar in its arrangement to the tables in my earlier notes.

Star	Δ epoch	ΔΘ	ρ disc.	Δρ	Mags.
A 217	18^y.1	+24°.1	0″.17	−0″.02	8.8—8.9
A 218	18 .1	−20 .4	0 .17	+0 .07	8.4—8.5
A 513	15 .3	−29 .9	0 .42	+0 .04	9.0—9.2
A 655	14 .6	+23 .4	0 .28	+0 .06	8.2—8.5
A 1092	14 .2	−28 .4	0 .28	+0 .05	9.5—9.7
A 1256	11 .9	+15 .4	0 .13	+0 .02	7.2—7.4
A 1544	11 .5	−36 .1	0 .16	+0 .04	9.2—9.2
AB & C	10 .2	− 2 .2	1 .33	−0 .06	—10.5
A 1609	11 .9	+34 .6	0 .40	+0 .05	8.5—8.5
AB & C	11 .9	+ 6 .0	2 .14	+0 .28	—13.0
A 1614	12 .0	+45 .5	0 .29	+0 .07	9.0—9.1
A 1621	11 .6	+ 8 .5	2 .23	+0 .27	8.5—13.5
A 1737	11 .4	−19 .7	0 .31	−0 .02	9.3—10.1
A 1746*	11 .7	+30 .0	0 .18	±0 .00	8.0—8.0
A & BC	10 .7	+ 1 .4	5 .69	±0 .00	6.7—
A 1913	10 .8	−20 .8	0 .22	±0 .00	9.6—9.6
A 1968	10 .7	−23 .7	0 .29	−0 .01	9.5—9.7
A 1971	11 .0	−33 .2	0 .35	+0 .16	9.1—9.2
A 2013	9 .5	−35 .5	0 .23	+0 .20	9.5—9.5
A 2030	9 .6	−32 .7	0 .31	+0 .05	9.2—9.3
A 2080	9 .4	+15 .9	0 .24	−0 .03	8.5—8.5
A 2131	8 .6	+44 .6	0 .32	−0 .01	7.0—8.2
AB & C	9 .0	− 1 .0	38 .79	+3 .97	—13.0
A 2210	9 .2	+ 8 .1	5 .06	−0 .20	7.4—13.7
A 2329	8 .0	−11 .9	0 .38	+0 .22	9.1—9.2
A 2462	7 .0	−68 .5	0 .22	−0 .07	9.5—9.5

There are many pairs in this and in the four preceding lists in which the two components are of equal brightness and the quadrant

*A 1746 is the fainter component of the Struve pair Σ 1224. The Berlin A. G. Catalog gives the two components of the Struve pair slightly different proper motions; but the micrometer measures do not confirm this. The very small change noted in the last 100 years is probably due to slow orbital motion.

therefore indeterminate. In every such instance, if measures at but two epochs are available, I have taken the quadrants which give the smaller of the two possible values of the apparent angular motion. Doubtless this is the correct interpretation in the majority of cases; but it is not at all improbable that in some of these pairs the larger value corresponds to the true motion. Further, it is possible that, in an occasional pair having components of equal brightness, the actual motion is one-half of a revolution or even a whole revolution altho the measures at the two epochs seem to indicate no change whatever.

For example: The discovery measures, in 1902, of A 417 (= 83 Aquarii) gave the position, 61°.0, 0″.19, and those of A 88, in 1900, the position 353°.2, 0″.14, the components in each pair being of equal brightness; in 1919, my measures gave, respectively, 355°.2, 0″.15 and 188°.4, 0″.15. If measures in intermediate years were lacking it would be natural to assume retrograde motion in the former pair and an angular change of 66° in the 17 years; and, in the latter pair, direct motion with an angular change of but 15° in the 19 years. As a matter of fact, I have measured each pair annually, and these measures show that the observed motion in A 417 now amounts to 294°, the period of revolution being approximately twenty-four years, and that A 88 has made one and one-half revolutions since discovery, the period being 12.1 years.

These remarks may have an application to the case of the pair A 1746 AB entered in the table above. My measures in 1908 gave 140°.07, 0″.19; two accordant measures last month gave 170°.7, 0″.19, an apparent change of just 30° in the 11.7 years, as entered in the table. But measures on one good night in December, 1917, gave 139°.7, 0.″21. It is of course possible that I misread the micrometer on that night; but it is at least equally probable that the pair is in very rapid motion and that the change since discovery amounts to more than half a revolution. Measures in the latter part of this year will settle the question.

The angular separation of the majority of pairs listed above is very small. The decided increase observed in the separation of the components of A 1971, A 2013 and A 2329 probably means that the average angular motion in these pairs is greater than that indicated in the table. In the wider pairs A 1621, A 2210, and A 1609 AB & C, the change may be due to proper motion of the brighter component. There are not enough meridian observations

to decide this point. The binary pair A 2131 AB and its optical companion (= Ho 357) form the subject of a note in an earlier number of these *Publications*.[1]

January 2, 1920. R. G. AITKEN.

THE MICHELSON INTERFEROMETER METHOD FOR MEASURING CLOSE DOUBLE STARS

In the PUBLICATIONS for October, 1919, Mr. Hale describes observations made by Michelson and himself, using the interferometer with the 100-inch telescope. In order to apply the method to the measurement of close double stars, a simple apparatus with movable slits was constructed and a preliminary trial made on the night of December 30th by Mr. Pease and the writer.

The slits were about 4.5 mm. wide and 25 mm. long, and were mounted about 117 cm. inside the Cassegrain focus. The diameter of the cone of light at this point being about 73 mm., the arrangement was such that the slits could be separated by this amount. The apparatus carrying the slits could be rotated about the optical axis of the telescope, for determination of position angle. The fringes were observed thru an eyepiece of 1 cm. equivalent focus. With the slits at maximum separation, the fringes were found to be too close together for easy observation, so that a magnification three or four times greater is desirable, say a power of 50 to 100 diameters. Since the focal length of the Cassegrain combination is 1600 inches = 4060 cm., this would correspond to a telescopic magnifying power of 8000 to 16,000.

Algol (*β Persei*) was first observed. The fringes were fully visible for all distances and position angles of the slits. With the spectroscopic binary *Capella*, it was at once evident that the visibility changed with the position angle. The minimum distance between the slits, for which the visibility of the fringes is lowest (practically zero in this case), was found to be 38.7 mm., in position angle 148° (possibly 148° + 180°). Reduced to angular measure in accordance with the simple theory, this minimum distance gives 0″.042 as the separation of the components on December 30, 1919.

The object of the observations on December 30th was primarily to see whether the method can be applied to the measurement of

[1] *Publ. A. S. P.*, **31**, 197, 1919.